REMARKS

In view of the following discussion, the Applicants submit that none of the claims now pending in the application is anticipated under the provisions of 35 U.S.C. § 102 or 35 U.S.C. § 103. Thus, the Applicants believe that all of these claims are now in allowable form.

I. THE REJECTION OF CLAIMS 1, 3-11 AND 17 UNDER 35 U.S.C. 102

The Examiner rejected claims 1, 3-11 and 17 under 35 U.S.C. §102(b) as being anticipated by the Bellegarda patent (United States Patent No. 5,839,106, issued November 17, 1998, hereinafter "Bellegarda"). The Applicants respectfully traverse the rejection.

Bellegarda teaches a speech recognition method that employs a hybrid language model combining semantic and syntactic information. For example, in one particular embodiment, the hybrid language model comprises two different single-span language models (one semantic model, one syntactic model) that process a speech signal in series. The first, syntactic language model processes the speech signal and generates a first set of scores for a group of "most likely" candidate output messages. The second, semantic language model then processes the first set of scores to produce an improved hybrid score (in some cases re-ranking the candidate output messages), in essence "double checking" the results produced by the first language model. The hybrid language model thus provides an estimate of the likelihood that a word, chosen from an underlying vocabulary of the first language model, will occur given a prevailing contextual history governing the second language model.

The Examiner's attention is directed to the fact that Bellegarda does not teach, show or suggest the novel invention of generating or selecting the second language model based at least in part on the results from a recognition pass using the first language model, as positively recited by the Applicants' independent claims 1, 7, 9 and 10. Specifically, claims 1, 7, 9 and 10 recite:

1. A method for recognizing an utterance that pertains to a sparse domain, the sparse domain having a linguistic structure and a plurality of components, objects or

concepts, the method comprising the steps of:

acquiring a speech signal that represents an utterance;

performing a first recognition pass by applying a first language model to the speech signal;

selecting or generating a second language model based at least in part on results from the first recognition pass, on information regarding a linguistic structure of a domain within the speech signal, and on information regarding relationships among the domain components, objects or concepts within the speech signal; and

performing a second recognition pass by applying the second language model to at least a portion of the speech signal to recognize the utterance containing the speech signal. (Emphasis added)

7. In a speech recognition system, a method for recognizing an utterance comprising the steps of:

acquiring a speech signal that represents the utterance; and

performing a series of recognition passes, a second and subsequent recognition passes processing at least a portion of the speech signal using a language model that is constrained by a result of a previous recognition pass. (Emphasis added)

9. A method for generating language models between speech recognition passes, the language models based on a domain having a linguistic structure and a plurality of components, objects or concepts, the method comprising the steps of:

generating or acquiring a database containing information regarding the linguistic structure of the domain and information regarding relationships among the domain components, objects or concepts;

acquiring a result from a speech recognition pass, the result including a domain component, object or concept; and

generating a language model that includes a subset of the domain by using the result from the speech recognition pass to select information from the database. (Emphasis added)

10. In a speech recognition system, a method for generating language models based on a domain having a plurality of components, objects or concepts, the method comprising the steps of:

acquiring a result from a speech recognition pass, the result including a domain component, object or concept;

using the result from the speech recognition pass to perform a search on a database that contains information regarding relationships among the domain components, objects or concepts; and

generating a language model using a result from the database search.

(Emphasis added)

The Applicants' invention is directed to a method and apparatus for performing relational speech recognition. In various speech recognition applications, including speech recognition-based Global Positioning System (GPS) navigation systems used in automobiles, it is particularly desirable to produce accurate speech recognition results based on limited user input. Existing applications typically require a great deal of user interaction in order to produce the correct results; for example an application may ask a user to speak only one word at a time for recognition, or may ask a user several questions after performing an initial recognition pass in order to further refine the results. This is not only time consuming for the user, but may distract the user from other tasks, such as driving.

The Applicants' invention addresses the aforementioned concerns by making use of observable relationships among words in sparse domains. A first recognition pass is performed by applying a first language model to a query (*e.g.*, an acquired speech signal) in order to recognize at least some of the words in the query (for example, a street name and zip code of a spoken address). These results may then be combined with information regarding the linguistic structure of the query's domain, or information regarding relationships among concepts, objects or components in the query's domain, in order to form a second language model having a more narrowly tailored search space than the first language model (for example, comprising street numbers occurring on streets of the recognized name within the recognized zip code). This second language model is then applied to at least a portion of the original query in order to refine the results obtained by the first recognition pass using the first language model (*e.g.*, by recognizing the remainder of the query). This iterative process may be repeated several times until satisfactory recognition of the spoken query is achieved.

By contrast, Bellegarda only teaches applying two pre-existing language models, based on two different language constraints (one syntactic, one semantic) to a speech signal. Bellegarda does not teach that the second language model is constrained by (*e.g.*, built or selected based at least in part on) the results produced by the first language model, just that the second language model re-processes these results in accordance with a different context. As discussed above, building a second language

model using recognition results produced by a first language model allows the second language model to be constrained or tailored to a domain that allows for quicker, more meaningful processing. Nowhere does Bellegarda teach or suggest that the domain of the second language model is guided or constrained or is in any way influenced by the results produced by the first language model. Thus, for at least these reasons, Bellegarda fails to anticipate the invention recited by claims 1, 7, 9 and 10. Claims 1, 7, 9 and 10 are therefore patentable over Bellegarda.

Claims 3-6, 8, 11 and 17 depend from independent claims 1, 7, 9 and 10 and recite additional limitations therefore. Thus, for at least the reasons stated above, claims 3-6, 8, 11 and 17 are also not anticipated by Bellegarda and are patentable under 35 U.S.C. §102(b). Accordingly, the Applicants respectfully request that the rejection of claims 1, 3 -11 and 17 over Bellegarda be withdrawn.

II. THE REJECTION OF CLAIMS 2 AND 12 -13 UNDER 35 U.S.C. 103

The Examiner rejected claims 2 and 12-13 under 35 U.S.C. §103(a) as being unpatentable over Bellegarda. The Applicants respectfully traverse the rejection.

Bellegarda has been discussed above. As discussed, Bellegarda does not teach, show or suggest every limitation of independent claims 1 and 10. Specifically, Bellegarda does not teach, show or suggest the novel invention of generating or selecting a second language model based at least in part on results from a recognition pass using a first language model, as positively recited by the Applicants' independent claims 1 and 10. Claims 1 and 10 are therefore not obvious in light of Bellegarda.

Claims 2 and 12-13 depend, respectively, from independent claims 1 and 10 and recite additional limitations therefore. Thus, for at least the reasons stated above, claims 2 and 12-13 are also not made obvious by Bellegarda and are patentable under 35 U.S.C. §103(a). Moreover, the Applicants respectfully disagree with the Examiner's taking Official Notice with regard to the limitations recited in claims 2 and 12 and respectfully request that the Examiner provide specific reference to such teachings. Accordingly, the Applicants respectfully request that the rejection of claims 2 and 12-13 over Bellegarda be withdrawn.

III. THE REJECTION OF CLAIMS 14-16 UNDER 35 U.S.C. 103

The Examiner rejected claims 14-16 under 35 U.S.C. §103(a) as being unpatentable over Bellegarda in view of the Digalakis patent (United States Patent No. 5,825,978, issued October 20, 1998, hereinafter "Digalakis"). The Applicants respectfully traverse the rejection.

Bellegarda has been discussed above. As discussed, Bellegarda does not teach, show or suggest every limitation of independent claims 1 and 10. Specifically, Bellegarda does not teach, show or suggest the novel invention of using results from first database search (*e.g.*, recognition pass) to generate a language model for a second recognition pass, as positively recited by the Applicants' independent claim 10.

Digalakis does not bridge this gap in the teachings of Bellegarda. In particular, Digalakis, like, Bellegarda, does not teach, show or suggest generating or selecting a second language model based on recognition results produced by a first language model. In fact, the portions of Digalakis that the Examiner cites to support the rejection do not even address the actual process of recognizing speech, but rather describe a method for developing (*e.g.*, training and storing) models for recognizing individual phones of speech, such as Hidden Markov Models. Claims 1 and 10 are therefore not obvious over Bellegarda in view of Digalakis.

Claims 14-16 depend from independent claim 10 and recite additional limitations therefore. Thus, for at least the reasons stated above, claims 14-16 are also not made obvious by Bellegarda in view of Digalakis and are patentable under 35 U.S.C. §103(a). Accordingly, the Applicants respectfully request that the rejection of claims 14-16 over Bellegarda in view of Digalakis be withdrawn.

IV. INFORMATION DISCLOSURE STATEMENT

An information disclosure statement is being separately submitted by the Applicants, including one reference of which the Applicants have recently become aware. The Applicants respectfully request that the Examiner review this reference in connection with the present application.

V. CONCLUSION

Thus, the Applicants submit that all of the presented claims fully satisfy the requirements of 35 U.S.C. §102 and 35 U.S.C. §103. Consequently, the Applicants believe that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the issuance of a final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

2/22/05
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